If you are using a printed copy of this procedure, and not the on-screen version, then you MUST make sure the dates at the bottom of the printed copy and the on-screen version match.
The on-screen version of the Collider-Accelerator Department Procedure is the Official Version.
Hard copies of all signed, official, C-A Operating Procedures are kept on file in the C-A ESHQ Training Office, Bldg. 911A.

C-A OPERATIONS PROCEDURES MANUAL

7.1.59 Regeneration of Cold Turbines "A" Train

Text Pages 2 through 7

Hand Processed Changes

HPC No.	Date	Page Nos.	Initials

Approved: _____***Signature on File***_____ _____
Collider-Accelerator Department Chairman Date

S. Sakry

7.1.59 Regeneration of Cold Turbines "A" Train

1. Purpose

To provide instructions for regenerating the cold turbine "A" train on the RHIC 25 kW helium refrigerator. The procedure is used to warm the turbines and remove moisture. The procedure contains the following sections:

5.1 Regeneration of turbine 5A only.
5.2 Regeneration of turbine 6A only.
5.3 Regeneration of turbines 5A , 6A and heat exchanger HX7A.

2. Responsibilities

2.1 The Shift Supervisor, or an Operator designated by the Shift Supervisor, is responsible for conducting the procedure and providing documentation in the Cryogenic Control Room Log and in the Cryogenic Valve Log.

2.2 Should a problem arise in the process of the procedure, the Shift Supervisor shall report to the Technical Supervisor for instructions before continuing.

3. Prerequisites

3.1 The Operator shall be trained by the Shift Supervisor.

3.2 Operator shall be familiar with the refrigerator P&ID drawing 3A995009, the physical location of components on the refrigerator, and the refrigerator control pages found on the CRISP control system. Valves and equipment mentioned in this procedure will be found on drawing 3A995009.

3.3 The regeneration skid must be available for use.

4. Precautions

4.1 If there is liquid helium in the refrigerator pots, all personnel entering the refrigeration wing of 1005R must be ODH Class 1 qualified, have a Personal Oxygen Monitor (POM) and carry an emergency escape pack, if the refrigerator is operating.

5. Procedure

5.1 Turbine 5A Only

_____ 5.1.1 Date_____.

_____ 5.1.2 Ensure mechanical brakes are installed per C-A-OPM 7.1.26, "Expander Brake System Installation and Removal."

_____ 5.1.3 Ensure the following valves are closed:

Process:

H385A____
H397M____

Valves to Atmosphere, Relief Header or Pure Helium:

H414M____	H695M____
H814M____	H795M____
H431M____	H700M____
H793M____	H412M____
H9184M____	

_____ 5.1.4 Start the regeneration (regen) skid per C-A OPM 7.1.36, "Regeneration System Normal Operation."

_____ 5.1.5 Ensure that the regulator PR9182M has been replaced with the spool piece.

_____ 5.1.6 Open the following valves:

H430M____	H812M____
H393M____	H390A____ (Vanes)
H9182M____	
H395M____	

_____ 5.1.7 Close regen manifold bypass valve H9100M.

_____ 5.1.8 Turn on regen skid pre-heater.

_____ 5.1.9 Monitor temperature at TT389H.

_____ 5.1.10 When TT389H reaches 290°K, continue to regenerate for at least one hour. Hygrometer reading must be –20°C to –40°C and improving less than 0.5°C/hour.

_____ 5.1.11 Turn off regen skid pre-heater.

_____ 5.1.12 Open bypass valve H9100M.

_____ 5.1.13 Close the following valves:

H390A____ (Vanes)	H9182M____
H812A____	H393M____
H395M____	H430M____

_____ 5.1.14 Secure the regen skid per C-A OPM 7.1.36.

_____ 5.1.15 Install regulator PR9182M.

_____ 5.1.16 Purge expander 5A per C-A OPM 7.1.24, "Cold Expander Purge Procedure."

5.2 Turbines 6A Only

_____ 5.2.1 Date_____.

_____ 5.2.2 Ensure mechanical brakes are installed on turbine 6A per C-A OPM 7.1.26, "Expander Brake System Installation and Removal."

_____ 5.2.3 Ensure the following valves are closed:

Process:

H402A____
H410M____
H409M____

Valves to Atmosphere, Relief Valve Header or Pure Helium:

H393M____	H700M____
H793M____	H795M____
H431M____	H695M____
H814M____	H395M____
H9192M____	

_____ 5.2.4 Start the regeneration (regen) skid per C-A OPM 7.1.36, "Regeneration System Normal Operation."

_____ 5.2.5 Ensure that regulator PR9190M has been replaced with the spool piece.

_____ 5.2.6 Open the following valves:

H430M____	H412M____
H414M____	H812M____
H9190M____	H464A____ (Vanes)

_____ 5.2.7 Close regen skid bypass valve H9100M.

_____ 5.2.8 Turn on regen skid pre-heater.

_____ 5.2.9 Monitor temperature at TT408H.

_____ 5.2.10 When TT408H reaches 290^{o}K, continue to regenerate for at least one hour. Hygrometer reading must be –20^{o}C to –40^{o}C and improving less than 0.5^{o}C/hour.

_____ 5.2.11 Turn off regen skid pre-heater.

_____ 5.2.12 Open bypass valve H9100M.

_____ 5.2.13 Close the following valves:

H464A____ (Vanes)	H9190M____
H812M____	H414M____
H412M____	H430M____

_____ 5.2.14 Secure the regen skid per C-A OPM 7.1.36, "Regeneration System Normal Operation."

_____ 5.2.15 Install regulator PR9190M.

_____ 5.2.16 Purge expanders 6A per C-A OPM 7.1.24, "Cold Expander Purge Procedure."

5.3 Turbines 5A, 6A and Heat Exchanger HX7A

_____ 5.3.1 Date_____.

_____ 5.3.2 Ensure that mechanical brakes are installed on turbines per C-A OPM 7.1.26, "Expander Brake system Installation and Removal."

_____ 5.3.3 Ensure the following valves are closed:

Process:

H385A____	H410M____
H399M____	H409M____

Valves to Atmosphere, Relief Header or Pure Helium:

H414M____	H395M____
H814M____	H9190M____
H431M____	H700M____
H793M____	H795M____
H9184M____	H695M____

_____ 5.3.4 Start the regeneration (regen) skid per C-A OPM 7.1.36, "Regeneration System Normal Operation."

_____ 5.3.5 Ensure that the regulator PR9182M has been replaced with the spool piece.

_____ 5.3.6 To avoid spinning turbines, ensure pressure in HX7A is approximately equal to pressure in expanders (within 0.5 atm).

_____ 5.3.7 Open process valves H397M____ and H402A____(air line must be jumpered at valve).

_____ 5.3.8 Open the following valves:

H430M____	H812M____
H393M____	H390A____ (Vanes)
H9182M____	H464A____ (Vanes)
H412M____	

_____ 5.3.9 Close regen manifold bypass valve H9100M.

_____ 5.3.10 Turn on regen skid pre-heater.

_____ 5.3.11 Monitor turbine 6A outlet temperature at TT408H.

_____ 5.3.12 When TT408H reaches 290^{o}K, continue to regenerate for at least one hour. Hygrometer reading must be –20^{o}C to –40^{o}C and improving less than 0.5^{o}C/hour.

_____ 5.3.13 Turn off regen skid pre-heater.

_____ 5.3.14 Open bypass valve H9100M.

_____ 5.3.15 Close the following valves:

H464A____ (Vane)	H9182M____
H390A____ (Vane)	H393M____
H812M____	H430M____
H412M____	

_____ 5.3.16 Install regulator PR9182M.

_____ 5.3.17 Purge expanders 5A, 6A and heat exchanger HX7A per C-A OPM 7.1.24, "Cold Expander Purge Procedure."

_____ 5.3.18 Close the following process valves:

H402A____ (return air line to normal)
H397M____

_____ 5.3.19 Secure regen skid per C-A OPM 7.1.36, "Regeneration System Normal Operation."

6. Documentation

6.1 The check-off lines are for place keeping only. The procedure is not to be initialed or signed, it is not a record.

6.2 The Shift Supervisor shall document the completion of the procedure in the Cryogenics Control Room Log.

7. References

7.1 C-A OPM 7.1.26, "Expander Brake System Installation and Removal"

7.2 C-A OPM 7.1.36, "Regeneration System Normal Operation"

7.3 C-A OPM 7.1.24, "Cold Expander Purge Procedure"

8. Attachments

None